Restocking the floodplains

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Since 1990 ODA has been co-funding with the World Bank the Third Fisheries Project in Bangladesh. Essentially, the project is concerned with the stocking of up to 100,000 ha of floodplain with large numbers of carp fingerlings in a cost effective fashion in order to improve the returns from the open water fisheries to the rural communities which depend upon them.

The rationale for the project was that in the past the most important proportion of the fish catch was provided by the group of local fishes called "major carps" which were generally perceived to have diminished in recent years; the returns from the fishery could therefore be enhanced by artificially restocking the carps. This perception seems to have been essentially correct. The major carps comprise four principal species, rui (*Labeo rohita*), catla (*Catla catla*), mrigal (*Cirrhinus mrigala*) and calbasu (*Labeo calbasu*). A recent ODA Fisheries Management Science research project showed that in the Indian sector of the ganges river system, just beyond Bangladesh, catches of major carps at some sites have shown a fall from around 47% of the catch in the 1950s, to around 6-7% at present. The reason for this decline stems from the fact that the major carps are the most popular fish in the sub-continent. Consequently, not only have the adults been caught for food, but large quantities of carp spawn and hatchlings have been taken directly from the rivers to provide seed for extensive aquaculture operations. In addition, the growing demands on land and water have meant that increasingly the flood and the floodplain are being regulated and modified. This renders them less available for floodplain spawning species, such as the major carps. As a consequence of all these processes there should exist vacant niches in the floodplain which can be filled by enhanced artificial recruitment, through restocking with mass produced fingerlings. One of the virtues in doing this is that the main proponents of the open water floodplain fishery are traditionally marginalised groups, and the increasing numbers of dispossessed and landless. In many ways these are the poorest of the poor, although not universally so.

To have any real impact upon fishing returns from significant fisheries, the numbers of juveniles released must be very large. At the recommended stocking density of 20kg ha^{-1} and mean fingerling size of 7g, a site of 10,000 ha requires the release of 28 million fingerlings. This clearly requires a very cost effective means of mass production of fry. In Bangladesh, whilst there are government hatcheries, a decade ago as part of another development project, a Hungarian hatchery specialist devised a simplified "backyard" technique for rearing carp hatchlings. This took off explosively amongst rural communities to service an expanding aquaculture industry, thereby launching a buoyant private sector hatchery and nursery operation. This private sector business provided the mechanism which made possible the realistic stock enhancement of the floodplains. The costs were clearly going to be substantial and consequently the World Bank insisted that a rigorous production monitoring system was put into place to allow a thorough cost benefit evaluation of the project to be made..

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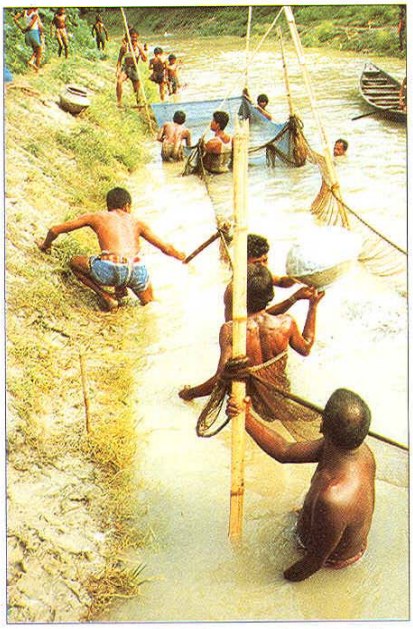
Aeration arrangements in fingerling holding ponds prior to transport

The specific role of ODA was to support the institutional management capability of the project. The Department of Fisheries in Bangladesh was not being required to produce the fingerlings, but to operate a huge procurement and tendering operation to obtain, from the private sector, millions of fingerlings to be delivered to specific locations, at specific times, at release points in the floodplain. The essential feature was to reinforce the institutional capacity of the DOF to manage major projects and particularly to develop the skills of contract management. To achieve this, ODA has been funding a consultancy, the Management Technical Assistance (MTA), for the duration of the project. A second component, termed Support Technical



Reception hapas for 12 hour conditioning of fingerlings in beels

Contractors' boats unloading fingerlings

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Checking quantities of fingerlings delivered on floating release platforms.

Assistance, has been funded by the World Bank to provide back-up on technical issues. A special feature of the ODA support is that it is provided not just to DOF Headquarters in Dhaka but also to the regional offices where the stocking takes place.

A typical cycle of events begins in October when the areas to be stocked are decided on by the DOF and the weight, specifications and species composition of the fingerlings required, determined. Public tenders for these requirements are then launched, with contractors being appointed in January at the beginning of hatchery operations across the country, for the new spawning season. Some quality assurance inspections by DOF are carried out on contracted nurseries during fingerling production. The contractors must deliver their fingerlings to properly established and prepared stocking points around the floodplains during the rising flood over a one month period from mid-June to mid-July. Receipt of fingerlings is signed off at the release points by representatives of DOF and the contractors, supported by the ODA management advisers. A third party was also involved at ODA's behest in the early days and this was the presence of the representative of an independent certification company, in line with international programme procedures. Thus a third signature was required for payment to be agreed to by the World Bank, who were providing the credit to DOF for purchase of the fingerlings.

Typically, some 450 mt of fingerlings were contracted to be delivered in the month for stocking. The logistics of transport, reception and release were complex, particularly bearing in mind the physical difficulties of reaching some of the sites. In the first year, early performance of contractors was erratic, but strict contract management and the presence of international certification showed that contractors could perform to specifications. Consequently, in each year of stocking, more than 85% of contracted totals have been delivered on time, and of the correct size and species composition. The reason for applying such strict procedures is to ensure that, since stock enhancement is essentially an expensive exercise, all true total costs can be evaluated and set against the equally rigorously assessed benefits. Large scale stock enhancement is as much of a management problem as a biological problem.

After stocking, the fingerlings are left to take their chance on the floodplain and to grow. Fishing communities need to be persuaded to avoid catching the carp fingerlings since, even at this size, they are eminently acceptable to the local market. This is something of a problem since it has become associated in the mind of some officials as a ban on fishing which has led to conflict. It has proved to be a valuable point for NGO involvement. From October onwards, after the main growing period in the floodplain, the carps can be caught and are an addition to the fisheries normally conducted in the floodplain. A tremendous variety of gears can be used, but typically the major groups are traps, gill nets, cast nets, large fixed gears such as lift nets, FADs termed khathas, and kuas, catching pits dug into the bed of the floodplain to trap fish in the residual water, as it drains off the floodplain.

The results from the first year of stocking were inconclusive since it coincided with a drought year, when even the yields from non-stocked species were down considerably in the production estimates from the previous baseline year as estimated from the intensive catch monitoring system operated under STA. This emphasises the fact that the floodplain is a dynamic system in which annual variation in flood regime will always play a significant part in determining the annual yield. Subsequently, annual returns from stocked species have shown substantial increments over a stocked area presently covering 30,000 ha. Currently the returns from stocked fingerlings are, on average, around ten times that of the weight stocked. There have been, however significant differences in the performance amongst the carp species stocked. The initial mixture was based on Chinese experience of stock enhancement in impounded areas. This features the silver carp as almost 50% of the weight to be stocked. The silver carp, however, proved to be ineffective since there was little development of plankton on floodplain waters, with most of the nutrients going into leafy vegetation, thereby limiting its food supply. It also proved to be the most migratory of the carps and largely disappeared from the system. The major carp species performed well but the response of the common carp, although only a minor component, was exceptional. Some individual common carp reached 2 kg and above within 3 months, evidently tapping into the rich fall of debris from the vegetation canopy. There still remains work to be done on deciding the best species mix and relating it to the nature of the floodplain. A start on this has been made by the Fisheries Research Institute of Bangladesh.

An overall economic evaluation of the project revealed that the average internal rate of return on the floodplain systems stock was some 17%, well above usual targets for investment projects. Clearly there are benefits to be had. General surveys throughout the fishing communities indicate that everybody has benefited to some extent, but there is the clear impression that the better-off have benefited disproportionately. The better-off include the leaseholders and kua owners. There are indications, however that where fishing communities are better organised, the poorer fishers are more able to benefit. This is an area where a much greater emphasis by NGOs is now being put into place.

Currently the stocking programme has been expanded further and a technical review of the procedures and social benefits is being conducted under the ODA Fisheries Management Science Programme. Ultimately, however, the project heralds the return of the country's most popular fish to the floodplains.

Checking specifications and quality of fingerlings samples prior to acceptance of contractor's delivery